Arguments for Islamic Science

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Consolidated Chemical Co. (*Typesettng Div*)
2035, Oasimjan Street, Delhi-110 006.
Tel.: 262521, 262545, Tlx.: 31-61988 HPIT IN

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The debate on the desirability of Islamic science in our time hinges, at least on one level, on the arguments Muslim scholars of science can produce to justify its need. Of course, on the other level, it depends on practical demonstration of the pragmatic utility of such a science. But at this stage of the debate there are numerous theoretical issues that need to be settled first. In this essay, I present four arguments justifying the need for a contemporary Islamic science which is a true embodiment of the values and culture of Islam.

I intend to show that science has had a different identity and has played a specific role in various civilizations, including the civilization of Islam. Moreover, I argue that western science, that is science as it is practiced today throughout the world, is inherently destructive and it does not, and cannot fulfill the needs of Muslims societies. Collectively, the four arguments present a very strong case for the contemporisation of Islamic science.

Argument One:

Different civilizations have produced distinctively different sciences

A civilization is an embodiment of its total spiritual and material culture. It is an open, and to some extent, self-perpetuating interchange between man, the values and norms inherent in his world-view and cosmology in their numerous dimensions and orders. Human history has seen a number of civilizations each seeking the realisation of its own values within the framework of its world-view. Behind each civilization there is a vision of man's place in creation which motivates its attitude towards Nature and promotes the search for its specific

problems and needs. Whitehead regards this vision, or world-view, as the central element which shapes the main characteristic of a civilization:" in each age of the world distinguished by high activity, there will be found at its culmination, and among the agencies leading to that cu1mination, some profound cosmological outlook, implicitly accepted, impressing its own type on the current springs of action.[1] It is this cosmological outlook, or *Weltanschauung*, that shapes the value structure of a society and political, social and problem-solving activities of a civilization.

Thus, at the centre of any civilization is a world-view which acts as a fulcrum on which the society flourishes or falls. The other parameters of a civilization- namely, culture, values and norms, social and political organisation and science and technology-derive their legitimacy from the world-view (Fg.1). The way the society is organised, the dominant values which shape its political structure and social organisation, how its material problems are solved, and how the individual members as well as the society as a whole seeks its cultural aspirations- all stem from the world-view.

As the world-view of different civilizations tends to be diff6rent, the associated parameters also tend to be different. For example, the Chinese world-view based on Confucianism, which dominated China for nearly twenty-five centuries, has produced a civilization and culture that is distinctively different from Greek culture and civilization. In essence, the world-view of Confuciansim, which was later developed by Mencius and Hsun Tzu, is characterised by humanism, occupying itself mainly with human relations subtilities

Figure 1 : Components of ***a Civilisation***

and the supernatural. The bases of Chinese worldview are the concepts of *jen,* humanity, tao, the doctrine of harmony, and *yin* and *yang,* the cosmic principles of male and female. The doctrine of *jen is* the central thesis of the whole system of Chinese thought. The ethics, the politics, the social organisation of the Chinese civilization all flow from the doctrine of *jen.*

Jen is defined as the "perfect virtue" and expresses the Chinese ideal of cultivating human relations, developing human faculties, sublimating one's personality and upholding human rights. Its basis is to be found first in one's duties towards one's parents and brothers. In the *Analects,* two other concepts, ***hsiao,*** filial piety, and *ti,* fraternal love, express the idea of *jen: **hsiao*** signifies a state of spiritual communion with the eternity of time, and *ti* signifies a state of

spiritual communion in the infinity of space. Hence these virtues have become the foundations of Chinese social structure. Mencius claimed that for the cultivation of virtue, *Jen* should be supplemented with *yi* “what one upholds in one's heart is *jen*; what one upholds in one's conduct is *yi”*. Thus *yi* is the virtuous principle for guiding external conduct. Hsun Tzu recommends *1i* as the norm of social conduct. *Li*, a code of ritual embodied in ancient Chinese culture, is also a set of general rules of propriety, the regulating principle in a well ordered society. It has often been translated as “social order,” “social institutions and conventions” or “all regulations that arise from the man-to-man relations.”

The world-view of *jen is* a major force in unifying China and shaping the mentality and temperament of Chinese people and Culture. The major characteristics of the Chinese people is that everyone, rich or poor, educated or illiterate, male or female, has profound respect for life. There is an insistence in Chinese culture that in order to live well, one must try and get the best out of life and enjoy what one has. The passionate love of life, the national characteristic of Chinese people, is coupled with a corresponding notion of rational happiness. "Rational happiness," a unique characteristic of the world-view of *jen,* is not based on worldly richer or external circumstances, but on one's own virtues. As Confucius said: “the wise are free from doubts; the virtuous from concerns; the courageous from fear.” And again: “the noble man is completely at ease- the common man is always on edge.”[2] Virtue lies in living with total harmony, in developing a sense of justice and fairness, a spirit of tolerance, a readiness to compromise; and a firm determination to enforce the observance of these virtues against egoism and altruism. Exaggeration, or total absence

of *jen,* would upset the social order and both altruism and egoism are too one sided and extreme and could lead to calamities. The way of *jen* is a way of action that avoids going to extremes, but leads to a state of mind which combines human reasoning and feeling to reach perfect harmony. Only harmony can bring about balance, and only balance can lead to progress. Harmony is obtained by fulfilling one's duties with one's relationships (1) with oneself**,** (2) with one's family, (3) with the community, (4) with the nation, and (5) with the world. Hsun-tzu symbolised *1i with five characters--Heaven, Earth, Emperor, Ancestors and Tutors. The ethics of jen, yi* and *1i* stresses the moral importance of human relationships in politics. In the last analysis, virtue alone constitutes the ultimate goal of man.[3]

In contrast, the Greek world-view saw rational knowledge as the ultimate goal of man. Formal religion in Greece revolved around Olympian gods under their leader, Zeus, who was dominant. Although Zeus was supreme, the Greeks did not regard him as the creator of the world but only as a ruler. Indeed, his supremacy was qualified by the fact that the other gods had independent wills and functions Important among them were: Apollo, whose concerns covered medicine, the care of animals, music, and the Delphic Oracle; Hera, Zeus's consort and protectress of marriage, Poseidon, the sea-god and bringer of earthquakes; Athene, patroness of Athens and of the arts, and Aphrodite, goddess of love. Dionysus gained importance over time as a vegetation deity and as the focus of ecstatic cults. The gods spent most of their time fighting with each other and, in particular, with Titans, the gods of evil. Greek religion was at its most personal and ecstatic in the worship of Dionysus who gained a mystical significance when Orphism, a movement that

became influential in the sixth and fifth centuries BC, adopted his worship. The legend was the Dionysus, under the name of Zagreus, was son of Zeus by the earth goddess Sernele, but was killed and eaten by the Titans. Zeus in anger burned up the Titans with thunderbolts and from their ashes the human race was formed. Hence man is a combination of evil (he is Titanic) and good (for he contains an element of the divine Zagreus). The Orphics believed that the body was a tomb that imprisoned the soul; they taught reincarnation and in this and other way influenced the thinking of Plato and other philosopher-scientists.

As the city-state developed, religion was increasingly integrated into political and civic life. The cult of the hero or patron of the city expressed the unity of the state as an expanded form of the clan or family. The former Greek religions shunned mystical cults like the Orphics who practiced their rituals in secret. From the world-view of many gods looking after different aspects of the world, emerges the central political notion of a city-state; the Greek civilization consists of many city states, who like the gods had individualistic outlook, and the Greeks could seldom agree to act in common.

Order was the main notion of Greek world-view. A measured balance of forces in society produced a well-ordered state. Order in society meant that every one knew its position and performed the task. Order was to be found in rational knowledge. In ethical order, goodness comes from the pursuit of reason, and evil from ignorance. The Greek way of life was mainly secular dividing functions into,various compartments -indeed, reductionism was the cornerstone of Greek world-view and culture.

For example, Socrates, the father of Greek philosophy,

believed that the soul has in decending, order, a rational part, an emotional part, and an aquisitive part. In the just soul these are properly ordered, each attending its own business and obeying the parts above it. Reason, at the top, rules emotion. Emotion, in turn, helps to inspire the actions that reason dictates. When the parts are, so ordered that a subordinate part gains an upper hand, the soul is sick, Because the soul is ruled by reason, it is akin to the realm of Form-the eternal, unblemished objects of knowledge over which the Form of the Good is supreme. Similarly, Socrates divided the city-state into three types of citizens, first, the common people, the workers, the artisans and the merchants; second, the military, whose task was to protect the city-state from outside dangers and keep the order within: third, the rulers and the guardians, who govern and legislate. To ensure the stability of this kind of system, the three orders are kept separate, and each is given training in its appropriate function: the people in their various skills; the soldiers in the art of war, and the rulers in government.

Like in the Chinese world-view, the Greeks considered that the good life is attained by performing to the goal or purpose of human existence, but here the purpose of life is seen not as the pursuit of *jen, ye* and *1i* but as the pursuit of reason. Aristotle, for example, sees the principal occupation for a man who would aim at goodness as the virtuous exercise of reason. Happiness is a virtue called reason: “If happiness is activity in accordance with virtue, it is reasonable that it should be in accordance with the highest virtue; and this will be that of the best thing in us. Whether it be reason or something else that is this element which is thought to be our natural ruler and guide and to take thought of things noble and divine, whether it be itself also

divine or only the most divine element in us, the activity of this in accordance with its proper virtue will be perfect happiness."[4]

We see from this brief description, that the world-views of Chinese and Creek civilizations are distinctively different for Greeks reason is the supreme, almost divine, virtue; for the Chinese *jen*, the Confucian ideal of cultivation of human relations, developing human faculties, sublimating one's personality, and upholding human rights are the supreme virtues. While the Creeks emphasise individualism, separation of function and roles in society and the religious from the rational; the Chinese stress synthesis, a balance in inner and outer life.In the Greek framework, order comes from Form and separating the individuals and various aspects of social and political life; in Chinese thought men are interrelated and united so that order may be maintained. Needless to say, the two world-views produced two different and distinct cultures, values and norms, and social and political organisations.

The key question is did the two civilization also produced two distinct and unique systems of science and technology? Or, if science and technology is neutral, value free and universal system, as the conventional wisdom would lead us to believe, are the Chinese and Creek sciences identical?

Even a casual examination of Chinese and Creek sciences reveals that they are two distinct ways of knowing and solving problems.

In Chinese science, as indeed in the world-view of *jen*, unity of man and nature is a predominant positive value. The Chinese way of thinking and knowing is organic where the interconnections between various facts of material reality

and spiritual needs are emphasised. The fundamental ideas and theories of Chinese science revolve around the theory of Five Elements (*wu hsing*) and the Two Fundamental Forces(*Yin and Yang).* The theory of Five Elements goes back to Tsou Yen, the real founder of the Chinese scientific thought, who flourished around 350 and 270 BC. While basically naturaiistic and scientific, the theory of Five Elements also served a political function as it frightened the feudal masters and kept them on an appropriate path. Tsou yen describes the theory in the following words:

> The Five Elements dominate alternately. [Successive emperors choose the colour of their] official vestments following the directions [so that the colour may agree with the dominant element].
>
> Each of the five Virtues [Elements] is followed by the one it cannot conquer. The dynasty of Shun ruled by the virtue of Earth, the Hsia dynasty ruled by the virtue of Wood, the Shang dynasty ruled by the virtue of Metal, and the Chou dynasty ruled by the virtue of Fire.
>
> When some new dynasty is going to arise, Heaven exhibits auspicious signs to the people. During the rise of Huang Ti [the Yellow Emperor] large earthworms and large ants appeared. He said, " This indicates that the element Earth is in the ascendant, so our colour must be yellow, and our affairs must be placed under the sign of Earth." During the rise of Yu the Great, Heaven produced plants and trees which did not wither in autumn and winter. He said, "This indicates that the element Wood is in the ascendant, so our colour must be green, and our affairs must be placed under the sign of Wood..." During the rise of the High King Wen of the Chou, Heaven exhibited fire, and many red birds holding documents written in red flocked to the altar of the dynasty. He said, this indicates that the element Fire is in the ascendant, so our colour must be red and our affairs must be placed under the sign of Fire." Following Fire there will come Water. Heaven will show when the time comes for the *chhi* of Water to dominate.

> Then the colour will have to be black, and affairs will have to be placed under the sign of Water. And that dispensation will in turn come to an end, and at the appointed time, all will revert once again to Earth. But when that time will be we do not know.[5]

The Chinese conception of the elements was not so much in terms of fundamental matter but more in terms of fundamental processes. The theory was an attempt to classify the basic properties of material things when they undergo change. But the significant point is that by concentrating on relation rather than substance, Chinese thought emphasised the interconnectedness of man and nature as well as individual and society. Consider, for example, this passage from the ***Ta Tai Li Chi*** (Record of Rites of the Elder Tai), a compilation made between 85 and 105 CE, Where the insistence of seeing man and nature in a unified framework is so clear:

> Tseng Tzu said, "That to which Heaven gives birth has its head on the upper side: that to which Earth gives birth has its head on the under side. The former is called round, the latter is called square. It heaven were really round and the Earth really square the four corners of the Earth would not be properly covered. Come nearer and I will tell you what. I learnt from the Master [Confucius]. He said that the Tao of Heaven was round and that of the Earth square. The square is dark and the round bright, The bright radiates *chhi,* therefore there is light outside it. The dark imbibes *chhi,* therefore there is light within it. Thus it is that Fire and the Sun have an external brightness, while Metal and Water have an internal brightness. That which irradiates is active, that which imbibes radiation is reactive. Thus the Yang is active and the Yin reactive.
>
> The seminal essence *(ching)* of the Yang is called *shen.* The germinal essence of the Yin is called ling. The *shen* and *ling* (vital forces) are the root of all living creatures; and the ancestors of

> such high developments as rites and music, human-heartedness and righteousness; and the makers of good and evil, as well as of social order and disorder.
>
> When the Yin and Yang keep precisely to their proper positions, then, there is quiet and peace...
>
> Hairy animals acquire their coats before coming into the world, feathered ones similarly first acquire their feathers. Both are born of the power of Yang. Animals with carapaces and scales on their bodies likewise come into the world with them; they are born by the power of Yin. Man alone comes naked into the world; [this is because] he has the [balanced] essences of both Yang and Yin.
>
> The essence [or most representative example] of hairy animals is the unicorn, that of feathered ones is the phoenix [or pheasant;] that of the carapace-animals is the tortoise, and that of the scaly ones is the dragon. That of the naked ones is the Sage."[6]

Yin and *Yang,* the two fundamental forces of Chinese scientific thought are ever present in the Heaven as well as man, each one dominating the other in a wave-like succession. The Chinese classic, I *Ching* (The Book of Change), contains a mathematical exposition of the *Yin* and *Yang* theory. The book contains a series of 64 symbolic hexagrams, each of which is composed of six lines, whole or broken, corresponding to the *Yang* and the Yin. Each hexagram is primarily Yin or primarily *Yang,* and by a judicious arrangement it was found possible to derive all the 64 in such a way as to produce alternating *Yin* and *Yang.* while the *Yin* and *Yang* components never become completely fragmented and separated, however, at any given stage, in any given fragment, only one is manifested. In one respect, the I *Ching* provides a practical demonstration of the principle of *Yin* and *Yang.*

Within this theoretical framework, Chinese science

flourished and achieved tremendous heights. While at first sight it may appear that empirical and pragmatic work is not possible in such a framework, it would be a very misleading conclusion. Even in contemporary terms, the Chinese theoretical framework has many parallels: the Yin and Yang principle in genetics and the theory of Five Elements correspond to what we might call the five fundamental states of matter-"one could think of Water as implying all liquid, and Fire all gaseous states; similarly, Metal could cover all metals and semi-metals, and Earth all earth elements, while Wood could stand for the whole realm of the carbon compounds, that is, organic chemistry" However, to look at Chinese science with the perspective of Western science is to miss the point: Chinese science was aimed at meeting the practical and spiritual needs of the .Chinese civilization and not of Western society.

Within its framework, Chinese science was an empirical as was demanded by Chinese society. The Chinese produced major achievements in hydraulic science and engineering. They excelled in mathematics: the earliest indication of the abacus arithmetic ***(suan-p'an)*** appears in the work of Hsu Yo who lived around 150-200 CE. Much Chinese arithmetic originates from the classic treatise of Chang Ts'ang (d 152 BQ entitled *Chiu Chang Seen Shu* (The Arithmetical Rules in Nine Sections) in which there is the earliest known mention of the negative quantity (*fu*), and the tradition was maintained through several centuries, being noticeable in the Arithmetical Classic of Hsia-Hou Yang (600 CE). In the second century CE, the solution of indeterminate equations of the first degree, and a decimal system appearing the work of Sun-Tzu; an elaborate treatment of fractions and further work on indeterminate equations occurs

in the Arithmetical Classic of Chang C,h'iu-chien (650 CE); and by the early seventh century Wang Hsiao-t'ung had solved simple cubic equations in connection with the volumes of solids, to be followed by further contributions to the study of indeterminate equations by I-hsing (683-727); so that the body of knowledge in the *Chiu Chang Suan Shu* was gradually augmented. Medicine too was a major science in China and the Chang Chung-ching 'the Chinese Galen' led the field at the end of the second century with two treatises, one on dietetic and the other on fevers. It had many branches, including theoretical studies of health and disease, macrobiotics or the theory and practice of longevity techniques; pharmacognosy, the study of materia medical veterinary medicine: and acupuncture, a minor branch of therapeutics. Because the Chinese science clearly incorporated value considerations it has been assumed to be somewhat less "scientific." For example, Joseph Needham classifies geomancy-the science of wind and water which decides the auspicious placement of houses and tombs with respect to features of the landscape and aesthetics of land use-as a "pseudo-science" simply because empirical and precise work has been made subservient to value and aesthetic judgement. Experiments and theory building was an important part of Chinese science although it did not have a paramount importance as it has in Western science. Consider the probability of sticking pins in a human body randomly, without a theory, and hitting all the acupuncture points and absurdity of the suggestion that Chinese science lacked a theoretical and experimental base becomes all too obvious. Indeed, Chinese experimental work led to the discovery of the three great inventions which became crucial to the transformation of European society

from the Dark to the Industrial age: the magnetic compass, gun-powder, and the printing press.

From this rather brief and sketchy description of Chinese science, it can be seen that it not only has a Chinese flavour but a distinct Chinese identity. Within its given framework, it was very objective and rational and met the needs and solved the problems of the Chinese society and civilization. Its emphasis and priorities reflected the values of the Chinese world-view and its products enhanced the Chinese culture.

In contrast to Chinese science which showed the overwhelming tendency to argue and analyse phenomena in terms of dialectical logic 'where rigid "A or not-A" categorizations were avoided, Greek science was based on a linear logic and emphasised reduction. The foundation of Greek science is Aristotelian logic: here two general principles of proof are recognised-the law of *contradiction (nothing can both have and not have a given characteristic) and the law of excluded middle* (everything must either have or not have a given characteristic). The Greeks, in particular the Pythagoreans, saw the world as a vast mathematical pattern; and to seek mastery of this world one had to seek the numbers in things. Hence the emphasis in Greek science on mathematics and deductive logic.

The Greek emphasis on mathematics is personified by the Pythagorean thought. Pythagoras blended his science with his religious world-view and his politics. The Pythagorean community was a religious brotherhood for the practice of asceticism and the study of mathematics. The sect practiced a severe discipline which included secrecy, respect for the authority of the master, ritual purification, memory exercises, examination of conscience, and various taboos

concerning food. Pythagoras taught a cosmology that gave a special place to numbers, which were represented by points juxtaposed to form square, triangular and rectangular figures. "Things are numbers" was the Pythagorean motto. Pythagoras himself discovered the relation of simple numbers (2/1, 3/2, 4/3, which determine the principal intervals of the musical scale (forth, fifth, octave), and thought that the distances separating the heavenly bodies observed the same proportions.[8]

Many Greek philosopher-scientists were concerned with questions of life and ethics. Thus Aristotle's interest in natural and human world led him to biology and a taxonomy of a "scale of nature." Aristotle considered mathematics as an abstraction from natural reality, which for him was a complex, self-regulating system. He saw natural phenomena in terms of cause and effect and introduced the principle of *teleology* which led his biological studies to the problem of generation and the transmission of form between separate bodies. Aristotle explained why animals and plants grow into whatever they happen to become as though growing was like pursuing a goal. In physics and astronomy, he tries to explain the first cause of all phenomena, through the realisation of its purpose in the celestial cycles.

The Aristotelian doctrine that first principles are required for rational science was challenged by the Skeptic philosophers like Pyrrhon of Elis (fourth century BC who made doubt the central theme of their philosophy. Pyrrhon's follower, Timon, criticized the logicians because of their inability to arrive at sound starting points for their deductions. Sextus Empiricus (second century BC attacked the doctrine of syllogism for being empty as it is based on circular argument: the conclusion is presupposed in the premises. He also dismissed the theory of casuality arguing that only events that happen

at the same time can be linked, whereas causes precede effects. The causal relation is thus merely a mental construction. Skeptics did not believe in divine providence and tried to be detached, refraining both from judgement and action.

Despite the various stances of Greek philosopher-scientists, on the whole, Greek science is deeply entrenched in linear mathematical logic and the supremacy of deduction. Despite the powerful influence of the Pythagorean cult, it *is throughly* secular and exhibits a certain degree of rational arrogance. The Greeks were generally irreverent and disdainful, had a great opinions of themselves and despised all other people. All those who were outside their city-states were the barbarians. Thus they called the great funeral monument of Egypt *pyramids*, which is Greek for "wheatcake." Greek scientists were preoccupied with theory and pure mathematics, and largely shun, experimental and empirical work because they had a prosperous economy and comparatively simple political structure which gave them a certain amount of stability. Indeed when they were faced with a social problem it immediately reflected in their scientific thought. Thus, faced with an ever increasing number of beggars in Greece, Isocrates made a special study of the problem and suggested that they should be enlisted, drilled and hurled against the Persian Empire. If they could not conquer it outright, they could at least tear enough off its territory to provide living-space for themselves the alternative was unthinkable: “ *if* we cannot check the growing strength of these vagabonds," wrote Isocrates, "by providing them with a satisfactory life, before we know where we are they will be so numerous that they will constitute as great

a danger to the Greeks as do the barbarians." Isocrates" social remedies are reflected in the scientific thinking of his contemporary, Plato. Just as Isocrates sought to liquidate the vagabonds in Greece, Plato set out to liquidate the five disorderly vagabonds (planets) in the heavens. Fie set as a problem to all earnest students to find "'what are the uniform and ordered movements by the assumption of which the apparent movements of the planets can be accounted for." This problem had to be solved if Plato's astronomical ideas were to work, especially when he had turned it into a theology by which he wanted to reconstruct society.[9]

From the above discussion of Greek science, it can be seen that it has somewhat different identity than Chinese science. Not only are the emphasis and priorities of the two sciences different, but also the nature, characteristics, indeed the logic and methodologies, are also different. Now, can one generalise from this and argue that all civilizations have their distinct, unique styles of doing science which gives them particular characteristics and shapes their contents according to the culture and value structure of their specific world-view?

On the basis of pure logic, it seems unreasonable to assume that two given civilizations with different social and societal problems and different perceptions of reality and what constitute a solution, should produce a system for solving problems which should be identical. Schematically, the logical inconsistency in the conventional view that science is same for all mankind can be demonstrated quite clearly. Figure 2 represents two distinct civilizations. A and B; and W,C,V,PS and S represent world-view, culture, values and norms, political and social organisation and science, respectively. Now if:

WA # WB
CA # CB
VA # VB
PA # PB

what logic is there which suggests that: SA = SB?

As 1 have tried to show in the case of Chinese and Creek sciences, the two are different yet equally valid way of looking at reality and solving problems of society and civilization. If we look at other civilizations such as the Romans, the Hindus, Aztec or the Myons, we see that these civilizations too had their individual ways of knowing and solving problems. As an activity of human beings, science manifests itself as a process which occurs in time and space and involves human actors. These actors live not only in science, but in wider cultures, societies and civilizations. And each civilization stamps the unique characteristics of its worldview on the nature, style and content of the science of that civilization.

Figure 2

This brings me to my next argument: we need to reclaim Islamic science because science in the Muslim civilization performed a particular function, which shaped its character and contents. We can argue this by looking at the history of Islamic science.

Argument Two:

Islamic science in history had a distinctive identity expressed in its unique nature and characteristic style.

Islamic science flourished during the zenith of Muslim civilization, a period of some seven hundred years from 700 to 1500 CE. The science that evolved during this period has a distinct Islamic identity. This identity manifests itself in terms of epistemology-which shaped the outlook and the goals of science; and in terms of methods which effected the ways of doing as well as the content of science.

The epistemology of Islam emphasises the totality of experience and reality and promotes not one but a number of diverse ways of studying nature. The Islamic concept of knowledge, ilm, incorporates almost every form of knowledge from pure observation to the highest metaphysics. Thus ilm can be acquired from revelation as well as reason, from observation as well as intuition, from tradition as well as theoretical speculation. While the various diverse ways of studying nature and reality are equally valid in Islam, all are subservient to the eternal values of Quranic revelation. As such, Islamic epistemology emphasises the pursuit of all forms of knowledge within the framework of eternal values which are the cornerstone of the Islamic civilization.

Besides diversity, the epistemology of Islam also emphasises interconnectedness. All forms of knowledge are interconnected

and organically related by the ever present spirit of the Qur'anic revelation. Thus Islam does not only make the pursuit of knowledge obligatory but also connects it with the unique Islamic notion of worship: ilm is a form of ibadah (worship). As such, knowledge is pursued in obedience to, and for the pleasure of, Allah. Moreover, *ilm* is not just connected to *ibadah* it is also connected to every other Qur'anic value such as *khilafah* (trusteeship), adl (justice) and istislah (public interest). While the connection between *ilm* and *ibadah* means that knowledge cannot be pursued in open transgression of Allah's commands, the connection between *ilm and khilafah transforms* nature into the realm of the sacred. Man as the trustee of God, as the custodian of His gift, cannot pursue knowledge at the expense of nature. on the contrary, as the guardian of nature he seeks the understanding of nature not to dominate it but to appreciate the "signs" of God. The study of nature, therefore, leads to two outcomes: an understanding of the material world as well as reflection of spiritual realities. The interconnection between ilm and *istislah* ensures that knowledge is pu.rsued to promote equality, social justice and values that enhance the well being of Muslim society and culture.

Its emphasis on diversity and interconnectedness gives a very unique character to the epistemology of Islam. It provides a middle path for the pursuit of knowledge ensuring that no individual form of knowledge or method of knowing becomes the sole criteria of truth or is pursued to the exclusion of all others. it is for this reason that a predilection for systematic classification of knowledge is so noticeable in Muslim civilization. The classification of knowledge into its various branches was the prime occupation of many Muslim scholars of classical age.[10] It provided

a method indispensable to genuine scholarship and proved extremely fertile in the history of Muslim intellectual endeavour. Moreover, the insistence of Islamic epistemology on giving equal status to all forms of knowledge within a single matrix of values meant that Muslim scholars were able to accept and synthesise the existing sciences of various civilizations which they inherited. Once it became part of the framework of eternal Islamic values it was transformed into a new substance. However, while Islamic science, like Greek and Chinese science before it, had its own unique identity, unlike them, it was truly international because of the geographical spread and the cosmopolitan nature of Muslim civilization.

It was the concern of Muslim scholars with the classification of knowledge that enabled them, first, to appreciate the intellectual output of other civilizations and then to synthesise it with the world-view of Islam. Thus, right from the beginning Muslim scholars agreed on the fundamental division of sciences into Arabic (that is indigenous) and foreign (that is, predominantly Greek) sciences. However, as the process of synthesis proceeded knowledge was classified on more sophisticated basis that reflected the world-view of Islam. Thus, al-Farabi's (d 950) classification of knowledge follows the Aristotelian pattern but gives more emphasis to the linguistic sciences" and to *fiqh* (jurisprudence) and *Kalam* (speculative theology). But his younger contemporary, al-Khwarizmi (writing ca 976) already offers a classification which is more adequate or his material and incorporates a hierarchy of structure giving prominence to religious knowledge which provides the value structure within which all other forms of knowledge is sought. In the *Rasa'il Ikhwan as-safa,* an encyclopaedia compiled in the

tenth century by a group of scholars who called themselves the "faithful friends", metaphysics is placed on the same pedestrian as mathematics, logics and natural sciences. In ibn Hazm's treatise *The Categories of Sciences (Maratib alulum***)** we find a perfect fusion of knowledge and values. While establishing a hierarchy of sciences, ibn Hazm also insists on their interdependence. For ibn Hazm knowledge is the certainty *(tayaqqun)* of a thing as it is. He associates knowledge with four cardinal virtues: justice *(adl),* understanding *(fahm),* courage *(najdah),* and generosity *(jud).* This brings the intellect and knowledge close to each other in the pursuit of virtue. Knowledge is a multi-faceted thing, but the noblest knowledge is that which brings the individual closer to his Maker. A.G. Chejne summarises ibn Hazm's perception of knowledge as follows: Knowledge, like, faith is a passport to happiness in this life and in the Hereafter. As depositories of knowledge, faith and reasonalthough differing in nature-have an identical aim in ibn Hazm's thinking, that is, the attainment of virtues *(fada'il).* This approximation with faith and reason becomes more evident in his broad conception of knowledge. In as much as knowledge is related to the state of individual happiness on earth as well as in Heaven, it should be sought incessantly and disseminated, its seeker, however, should not boast about it because it is a gift from God.

He should always be humble with whatever knowledge he may have because someone else could have more knowledge than' he. Finally, knowledge should be put into practice, otherwise the ignorant person would appear better off than the scholar. In fact, knowledge and action ***(****al-ilm wa-l-amal)* go together and are inseparable, particularly with regard to the performance of the religious duties. In

consequence, the greatest virtue along with the practice of goodness is to teach and implement knowledge.

Ibn Hazm emphasised the middle path in the pursuit of knowledge in numerous statements found throughout his *Akhlaq.* For example,

The one who is greedy with his knowledge is more blameworthy than the one who is greedy with his money.

Intellectual inquiry will be useless if it is not supported by the good fortune of religion and by that of (the sciences) of the world.

Recondite sciences are like strong medicine; they help people with strong constitutions, but destroy those with weak bodies. Similarly, they will greatly enrich and purify the vigorous intellect, but they will destroy the weak one.

True science unvails the ignorance concerning the attributes of God-may He be glorified and exalted.

The utility of knowledge in the practice of virtue is enormous, for through it one will be able to know the beauty of virtue which will never escape him, he will also be able to know the ugliness of vices, avoiding them except upon on rare occasions; he will take heed of nice praise and will wish something like it for himself; he will also take heed of damnation and will attempt to avoid it. On these grounds, it is necessary to conclude that knowledge has a great deal to do with every virtue, and that ignorance has its share in every vice. Moreover, no one will ever achieve virtue without learning the sciences excepting those who possess pure natures and virtuous constitutions. To this category belong the prophets (may God's prayer and peace be upon them); this is so because God Almighty has taught them all goodness *(khayr)* without the intervention of man.[12]

The concern of such classical Muslim scholars as ibn

Hazm to synthesise values with knowledge and knowledge with action and virtue led to the classification of certain branches of knowledge as "blameworthy." It was clear to scholars and scientists of the "Golden Age of Islam" that the pursuit of all knowledge did not necessarily lead to virtue; that not all *ilm* can be connected with *ibadah* and the pleasure of Allah. The basis of the distinction is clearly set forth by Hujwiri.

> Knowledge is obligatory only in so far as is requisite for acting rightly. God condemns those who learn useless knowledge, and the Prophet said, 1 take refuge with Thee from knowledge that profiteth naught." Much may be done by means of a little knowledge and knowledge should not be separated from action. The Prophet said, the devotee without divinity is like a donkey turning a mill" because the donkey goes round and round on its own tracks and never makes any advances."[13]

Much has been said by orientalists and contemporary Muslim scholars of how such a distinction limits inquiry and suffocates science.[14] The subtility in the Muslim classification of knowledge and division of knowledge into those which promote human welfare and eternal values and those which squander resources or promote injustice and myths, cannot really be appreciated by those who measure the achievements of Islamic civilization by alien scales and by methods designed to show the almighty supremacy of reason. Only when one appreciates the value of synthesis, the connection between reason and revelation, can one really appreciate the deep insight shown by Hujwiri and other Muslim philosophers of knowledge. Behind the division of knowledge by al-Ghazzali, for example, into individually and socially requisite, and praiseworthy and blameworthy, is a deep commitment to maintain a social balance in society

and promote the values of the world-view of Islam. The classical scholars of Islam were concerned that in the pursuit of knowledge the needs of the community should not be lost sight of, that *ilm* should not create undesirable social effects, that it should not tend to such a level of abstraction that it leads to the estrangement of man from his world and his fellow men, or to confusion rather than enlightenment. In this framework science is guided towards a middle path. While it should be socially relevant, the idea of a purely utilitarian science is rejected. Moreover, there is no such thing as science for science's sake; yet the pursuit of pure knowledge for the perfection of man is encouraged. Science, far from being enjoyed as an end in itself, must be instrumental to the attainment of higher goal.

These special features of the epistemology of Islam gave rise to a unique tradition of science. For the classical Muslim scientists all experiences are real and therefore worthy of evaluation and investigation. To exclude any one of them is to exclude reality itself.. Thus, Muslim scientists did not believe in a single, all-encompassing method of inquiry, but used a number of methods in conformity with the object of study. This is a major feature of the style of Islamic science. Thus, we finds scientist in the classical period working with different methodologies, each as rigorous as the other, and accepting all methods as invaluable in themselves. They defined a particular method or sets of methods for each clearly defined discipline and considered these methods not as contradictory but as complementary. Of course, there were incidences of tension, Philosophers arguing with theologians each accusing the methods of the other to be unreliable, but by the large harmony prevailed and the principles of diversity and interconnectedness of Islamic

epistemology ensured that the multiplicity of methods were integrated into a totality. Thus it was possible to have several sciences dealing with the same subject each using its particular methods. A tree, for example, could be studied from the point of view of botany, hence observed and described, or medicine, hence its products tested and turned into drugs, or physics, hence its form and matter analysed, or even sufism, hence contemplated.[15] Indeed, it was not uncommon for an individual scientists, for example alBaruni, to have access to all these methods which he used to arrive at an integrated and coherent interpretation of reality. In all this he is always partial towards the truth and never looses the sight of word-view and the framework of values in his working-a practical demonstration of the pragmatic epistemology of Islam.

The hall mark of Islamic science in history is partiality to truth in all its multidimensional manifestations: Muslim scientists were well aware that objectivity reveals only part of the truth, that truth can also be found by other modes of inquiry. We can well illustrate this point by looking at the work of such a representative of islamic science as al-Baruni.

In al-Baruni we find a scientist who has integrated a number of methods in his very being; there is no such dichotomy as the "two cultures" of C.P. Snow here. AlBaruni never fails to remind his readers that there is more than one method of reaching the Truth. He starts one of his treatises with the word: I pray for God's favour and spacious bounty to make me fit for adopting the right course and help me in perceiving and realising the Truth and facilitate its pursuit and enlighten its courses (methods) and remove all impediments in achieving noble objects," Thus

for al-Baruni there are number of courses towards the Truth, a vital, living assimilative force which permeates every aspect of his scholarly outlook. Al-Baruni derives his emphasis on the truth from the Qur'an which he quotes often. In his preface to *India* he quotes the verses of the Quran which say "speak the truth, even if it were against yourselves." And it is in the pursuit of Truth, not of reason, that al-Baruni uses a number of methods.

Mathematics is central to al-Baruni's scientific research. He considers it natural that man should count the objects around him and to establish a quantitative correlation among them. But he also repeatedly stresses usefulness of knowledge as an important motive for his own research and promotion of science in general. In a purely technical book, *The Determination of Coordinates of Positions for the Correction of Distances between Cities*, he gives the following reason for pursuing knowledge:

> We look around and we see that man's efforts are directed only towards earning a living, and for this purpose he endures hardships and fears, though he needs his food only once or twice a day for his life in this world. But he pretends ignorance and neglects what he must not fall to do for his soul in the hereafter, five times in every day and night, thinking that his ignorance is a valid excuse, though he has the opportunity and the power to know 11 (what is good for his soul.
>
> The Jews also need a direction, because they turn in their prayers to the Temple in Jerusalem which is of known longitude and latitude ... The Christians need the (direction of) true east because their elders, whom they call fathers, prescribed to them that they should turn to Paradise in their prayers ... [16]

Yet he is not a complete utilitarian. Truth, in itself, is also beautiful for al-Baruni:

> It is knowledge, in general, which is pursued solely by man, and which is pursued for the sake of knowledge itself, because its acquisition is truly delightful, and is unlike the pleasures desirable from other pursuits.[17]

It is the synthesis of the approaches to knowledge into a middle path which is the hall mark of al-Baruni's science. It was this outlook that led to his theory of solar apogee which is considered to be one of the most original accomplishment in the history of science. In his *al-Qanun a-lMasudi* al Baruni starts his investigations by recounting the work of previous scientists and then presents, and evaluates the results of his own observation. He finds the solar apogee to be situated at 84' 59' 51 ", 9." But his results are arrived at by applying a method of his own, consisting of three essentially different variants, all three of which he shows to lead to the same numerical result. He bases his investigation on a theorem set forth first by Archimedes of which al-Baruni provides twenty different proofs. Briefly stated the theorem reads: if a broken line is inscribed in a circular arc, and if the perpendicular is drawn from the point bisecting the arc on the (major part of the) broken line, then the broken line too is bisected by the perpendicular. Of course, others before al-Baruni introduced new concepts and methods into astronomy, but what is unique to al-Baruni is the systematic consideration of the criteria according to which preference is to be given to one method over another. His investigation leads al-Baruni to infer that there undoubtedly exists a continual motion of the apogee in the direction of increasing longitudes. He goes further to demonstrate that the apogee and perigee are the points at which the apparent velocity reaches its extreme values and that, in passing from one to other, a continual increase or decrease of velocity will be observed-thus, making for the

first time, the concept of accelerated motion subject of'mathematical analysis. All this leads him to establish a value for the motion of procession: he states that the longitudes increase by one degree in 68 years and 11 months (the modern values is c. 71, 7.5m).[18]

AI-Baruni was aware of the limitations of the methods he used to develop his theory of solar apogee. For one thing it could not be used to equal effect in his study of India: "to execute our project, it has not been possible to follow the geometrical method which consists in referring back to what has been said before and not what has been said later."[19] In *India* al-Baruni uses methods nearer to those developed by Muslim jurists and the scholars of hadith. The truth here demands a different method but one which is just as systematic, rigorous and critical as the "geometric method." The methodology used in *India* is field work and is based on three cardinal principles: "hearsay does not equal eye witness;" "written tradition is the most preferable;" and, "the tradition regarding an event which in itself does not contradict either logical or physical laws will invariably depend for its character as true or false upon the character of the reporters." Combing these principles with field work and partiality towards truth, M-Baruni was able to produce one of the first and most detailed sociological analysis of India-an achievement that alone would have placed him amongst the great scholars of the world.

The ability to synthesise different methods in his work was not unique to al-Baruni. It was a general rule, rather than an exception. Ibn Sina, for example, was a master of integrating scientific research in a logical and metaphysical framework and developing different methods for different

disciplines. In his *al-Qanun fi'I Tibb,* (Canons of Medicine) ibn Sina argues that both speculative method as well as empirical observation and practice have role in medicine. The canons is a monumental work which shows ibn Sina's power of observation and ability for empirical work. just the breakdown of the canons reveals the scope of ibn Sina's medical researches: the first book presents a general introduction, dealing with physiology, nosology, aetiology, symptomatology and the principles of therapy. In the second book, the samples from the three realms of nature are presented, the strength, effect and use being given exactly. Special pathology covers the whole of the third book, with diseases enumerated in the order of where they occur in the body. Illness involving the whole body-fevers, ulcers, fractures and poisonings-are covered in the fourth book. The final fifth book deals with mixing of drugs. In the *canons,* ibn Sina also developed a method for discovering whether a particular drug has curative properties. A clear description of this method is given by Abul-Barakat al-Baghdadi who followed ibn Sina's lead in this matter.

> As for experience, an example is provided by the following judgment: scammony purges human bodies of yellow bile. In this [example] the frequency of the phenomenon puts out of court [the notion] that it might be due to chance. Because of the frequency of the experience these judgments may be regarded as certain, even without our knowing the reason [for the phenomenon]. For there is certain knowledge that the effect in question is not due to chance. It must accordingly be supposed that it is due to nature or to some modality thereof. Thus the cause qua cause, though not its species or mode of operation, is known. For experimental science is also constituted by a knowledge of the cause and by an induction based on all the data of sensation; whereby a general science is reached ...

> But in the cases in which the experiment has not been completed, because of Its not having been repeated in such a way that the persons, the lime and the circumstances varied in everything that did not concern the determining cause, whereas this cause [remained invariable], the experiment does not prove certain knowledge, but only probable opinion .[20]

Despite the fact that ibn Sina formulates a similar method in a more generalised and abstract form in some of his philosophical treatises, he is well aware of its limitation. It is in fact a close description of the experimental method which, ibn Sina believed, was more suitable to medicine and did not constitute an all-embracing Method of intellectual inquiry. Empirical observation and experimentation was only one method of knowing which had its uses in particular disciplines. Other disciplines required different methods.

Consider, for example, ibn Sina's method of providing evidence for prophecy. In answer to someone afflicted with doubts about prophecy, he writes:

> You have asked-may God set you right-that 1 sum up for you the substance of what 1 said to you for the purpose of eliminating your misgivings about accepting prophecy. You were confirmed in these misgivings because the claims of the advocates of prophecy are either logically possible assertions that have been treated as the necessary without the benefit of demonstrative argument or even dialectical proof, or else, impossible assertions on the order of fairy tales, such that the very attempt on the part of their advocates to expound them deserves derision.[21]

What follows is not an empirical demonstration of prophecy; but a carefully constructed, elaborated *psychological* proof of prophecy. Despite its inherent difficulties, the philosophical method is just as valid for ibn Sina as empirical observation. Similarly, in his work on linguistics, law,

philosophy, astronomy and Qur'anic exegesis, ibn Sina had recourse to different methodologies all of which were considered by him to be equally valid.

Even when a Muslim scientist, for example ibn al Haytham, placed very high level of confidence on observation, experimentation, and empirical analysis, he did not lose the sight of philosophical arid metaphysical methods. Ibn al-Haytham has been described by many western historians of science as the most secular of Muslim scientists because of his unquestioned commitment to science for science's sake. For example, his programme of methodological criticism has been compared to that of Descartes:

> Truth is sought for its own sake. And those who are engaged upon the quest for anything that is sought for its own sake are not interested in other things. Finding the truth is difficult, and the road to it is rough. For the truths are plunged in obscurity. It is natural to everyone to regard scientists favourably. Consequently, a person who studies their books, giving a free rein to his natural disposition and making it his object to understand what they say and to possess himself of what they put forward, comes (to consider) as truth the notions which they had in mind and the ends which they indicate. God, however, has not preserved the scientist from error and has no safeguarded science from shortcomings and faults. If this had been the case, scientists would not have disagreed upon any point of science, and their opinions upon any (question) concerning the truth of things would not have diverged. The real state of affairs is however quite different. Accordingly, it is not the person who studies the books of his predecessors and gives a free rein to his natural disposition to regard them favourably who is the (real) seeker after truth. But rather the person who is thinking about them is filled with doubts, who holds back with his judgement with respect to what he has understood of what they say, who follows

> proof and demonstration rather than the assertions of a man whose natural disposition is characterized by all kinds of defects and shortcomings. A person, who studies scientific books with a view to knowing the truth, ought to turn himself into a hostile critic of everything that he studies ... he should criticize it from every point of view and in all its aspects. And while thus engaged in criticism he should also be suspicious of himself and not allow himself to be easy-going and indulgent with regard to (the object of his criticism) If he takes this course, the truth will be revealed to him and the flaws ... in the writings of his predecessors will stand out clearly.[22]

But presenting al-Haytham's partiality for truth in a secular mould is a gross injustice to the celebrated scientist.[23] The fact that he demands a very exacting standard of criticism is not particularly original to al-Haytham: it simply reflects the methodological concerns of Muslim jurists and scholars of hadith. Where al-Haytham emphasised the pursuit of science for its own sake, he also emphasised the fact that it should be pursued within a framework of philosophy and theology. Al-Haytham's reputation undoubtedly rests on his mathematics and physics-in particular his vast researches on optics which make Newton's achievements look decidedly pale-but he was equally verse in metaphysics, philosophy, medicine and Islamic theology. Science and theology played an equal part in his philosophy; moreover, despite his belief in science *per se* he sought to serve his society. In a letter that he wrote some 13 years before his death, al-Haytham says:

> There are three disciplines which go to make philosophy: mathematics, physical sciences, and theology. 1 (have) discovered that duality and controversy are natural to human beings, and man is mortal; so that, while in his youth man can ponder over these three disciplines which govern his existence on earth, he cannot do so when he grows old. So 1 thought over

> these three philosophical disciplines so far as my ratiocinative and intellectual faculties could allow me and summarized and explained them and their branches ... 1 have three objects in adopting this view: first, to be of service to those who are in search of Truth; second, that the disciplines which have been able to understand to some extent should be extended and studied; and, third, the knowledge that 1 possess may turn out to be the wherewithal of my old age. [24]

Thus, for al-Haytham theology was just as real as science. He believed that Reality was a unitary entity which could be studied by both objective and subjective methods. For him knowledge and wisdom went hand in hand: I have always been haunted by the desire to seek knowledge and wisdom, and it has also dawned on me that there is nothing better than these two things to bring man closer to God," he writes.[25]

For al-Haytham the pursuit of science without an ethical framework is inconcievable. And ethics, for al-Haytham, is a pragmatic concern not some abstract philosophical notion. He equates every action with accountability on the Day of Judgement. His ethical system is based on three main points: (1) beautification and perfection of morality are not possible without quest for knowledge; (2) truth, knowledge, and realisation of self depend for their acquisition on (a) a clear and thorough understanding of theology, (b) acquirement of good through noble deeds, and (c) avoidance of evil; and (3) the main object of beautification and perfection of morals is to enjoy a happy, eternal life in paradise in the Hereafter. It is this ethical edifice that forms the base of al-Haytham's works. [26]

Here then in al-Haytham we have a scientist from the classical period of Islam who introduced the inductive

method and who is an arch believer in rationality-a belief that has led many orientalists and western historians of science to dub him a secularist, an Aristotelian, even a scientist in the tradition of the Enlightenment: but whose rationality is subservient to his ethical system. So much so that al-Haytham was against the Mutazilites, the founders of the rational school of thought in Islam, and wrote several treatises against them. It is in fact an irony of fate that Basra, where the Mutazila movement had its origins, was also the birth place of one of the greatest physicists of Islam, indeed the entire mankind, whose other major field of interest was the refutation of the rationalist doctrine of the Mutazilities.

Al-Haytham, ibn Sina and al-Baruni are just three classical Muslim scientists in whose works we can show a synthesis of knowledge and values in operation. Modern Muslim historians have tended to study these and other scientists and scholars of early Islam largely from the perspective of their achievements, their intellectual and scientific output and have all too readily accepted the interpretation of western historians of science that their contributions neatly fit the linear progress of science from the days of the city states of Greece. Yet, even a casual examination of their methodologies and philosophy of science reveals an entirely different system of science: a system which believes not in single, all-pervasive Method but in methods and gives due importance to all; a system that believes in rationality but in a rationality that is subservient to an ethical code; a system that is based more on synthesis and integration than on reduction and isolation; a system that is essentially interdisciplinary that refuses to place different disciplines in watertight compartments; a system that draws its legitimacy from a world-view based on social and personal accountability; a system that draws its strength from a

matrix of Qur'anic concepts and values which it seeks to promote. How can such a system fit an imagined slot in the "linear progress of science?"

It was its emphasis on synthesis and interdisciplinary investigations, multiplicity of methods and social function and accountability before God, which produced an institution which is largely unique to Islam and is unparalleled by any other civilization: polymathy. The Islamic civilization of the classical period was remarkable for the number of polymaths it produced. This was a natural outcome of the nature of Islamic science; and the emphasis of Islamic science on a whole array of methods meant that the Muslim scholars were led by the system to study, write about and contribute to many, if not all, of the different branches of learning recognised in their day. They sought to master, if not the whole field of knowledge in all its details, at least the principles of every branch of learning which then existed. One can fill volumes with the names of Muslims polymaths of early Islam; the fact that al-Jahiz (d 868); al-Kindi (d 873); al Razi (d 925); al-ldrisi (b 1166) ibn Bajjah (d 1138); Omar Khayyam (d 517); ibn Zuhr (d 1162); ibn Tufail (d 1185); ibn Rushd (1198); and al-Suyuti (d 1505) and thousands of other scholars of this period were polymath is not an accident; it is a clear demonstration of the unique nature of Islamic science.

The extent of polymathy of the classical period, and the role that it played in the cultural life of that period, can be illustrated from two characters from the celebrated *Aliflail-wa-lal* (Thousand and One Nights): the barber who was versed in medicine, chemistry, grammar, oratory, logic, astronomy, geometry, arithmetic and algebra, and the slavegirl

Tawaddud, whose familiarity with the main principles of almost every branch of knowledge would put a modern scientist to shame! stability;

The existence of the polymath as a permanent feature of classical Islam is an indication of an intellectual attitude radically different from the dominant attitude of the western civilization. As M.J.L. Young points out, "what a contrast between this (western) disconcerting prospect of two mutually incomprehensible areas of human experience, and the possibility of being literate in one and totally illiterate in the other, with the homogeneity of culture which we find symbolised in the career of an Avicenna (ibn Sina), who, among his many other books, wrote a concise survey of the science of medicine in verse, consisting of 1326 stanzas; or which we find at perhaps its most striking form in Omar Khayyam, whose immortal quatrains have, at any rate in the west, overshowed his achievements in the very different field of mathematics."[27]

The motives and the driving force behind, polymathy was the paradigm that the physical universe was not inferior to the spiritual, that both as manifestations of Allah"s bounty and mercy, were worthy of study, and equally valid, Moreover, the methods of studying the vast creation of God-from the mystic's ecstasy to a mother's love to the flight of an arrow, the circumference of the earth, the plague that destroys an entire nation, the sting of a mosquito, the nature of madness, the beauty of justice, the metaphysical yearning of man-were all equally valid and shaped understanding in their respective areas of inquiry. Every creation of God is equally important as the subject of study and each step forward in understanding and appreciating His creation brings man closer to God. In no other civilization

has here been a more complete and thorough synthesis of science and religion.

It is this all-embracing emphasis on the unity of science and religion, knowledge, and values, physics and metaphysics, which gives Islamic science its unique character. And, it is its insistence on multiplicity of methods which gives Islamic science a characteristic style with synthesis as its main feature. This unique nature and characteristic style means that while Islamic science values systematic rigorous search for truth, it is not "objective" in a clinical sense- it does not kill off all it touches. Concern for social welfare and public interest, promotion of beauty and a healthy natural environment, as well as systematic observation and experimentation and rigorous mathematical analysis are hallmarks of Islamic science in history. As such, Islamic science *is subjectively objective;* that is, it seeks subjective goals within an objective framework. The subjective, normative goals include seeking' the pleasure of Allah, the interests of the community, promotion of such eternal Islamic values as *adl* (justice), *ibadah* (worship) and *khilafah* (man's trusteeship.). This contrasts sharply with naive inquiry which is based on emotions, dogma, bias and prejudices. Islamic science has nothing to do with the magic and the occult**:** it does not seek to introduce anarchy and dogmatism into the pursuit of knowledge, neither does it seek to impose the method of one discipline on to another. It simply sees to give equality to all methods of inquiry, and promote research and development within a framework of ethics and values which by nature are subjective. It therefore also contrasts radically with western science which excludes all other branches of knowledge and is based on a single Method which is considered to be outside human values and

societical concerns. Islamic science, on the other hand, seeks a *total understanding of Reality*. It is thus a very holistic enterprise.

Our brief historical analysis shows Islamic science to have a different entity than science as it is practiced today. We can summarise the nature and style of science of classical islam as a set of norms. Table 1 gives this summary and also compares it with the idealised norms of "conventional science" as developed by Ian Mitroff.

We now move on to my third argument for Islamic science; that western science carries within it seeds of its own and global destruction; and unless it is replaced by a more enlightened mode of knowing mankind will throw itself into an infinite abyss. Let us then look at the inherent nature of modern science.

Argument Three:

Western science is inherently destructive and is a threat to the well-being of mankind

It is a common belief, aggressively perpetuated by western historians of science and apologetic Muslim scholars, that today's scientists stand on the shoulders of their predecessors, specially Greek and Muslim scientists to place new bricks on the pyramid of knowledge, To some extent this is true: Newton did build on the work of al-Haytham, Harvey plagiarized ibn Nafis, and Kepler drew heavily from the studies of al-Battani, al-Baruni and other noted uslim astronomers. But, as I have just argued, Muslim scientists operated within an entirely different world-view: the nature and style of their science was quite different from the way science is practiced oday even if some of their results

A comparison between Western Science and Islamic Science

Norms of Western Science	*Norms of Islamic Science*
1. Faith in rationality.	1. Faith in revelation.
2. Science for science's sake.	2. Science is a means for seeking the pleasure of Allah; it is a form of worship which ahs a spiritual and a social function.
3. One all-powerful Method the only way of knowing Reality.	3. Many methods based on reason as well as revelation, projective and subjective, all equally valid.
4. Emotional neutrality as the key condition for achieving rationality.	4. Emotional commitment is essential for a spiritually and socially uplifting scientific enterprise.
5. Impartiality – a scientist must concern himself only with the production of new knowledge and with the consequences of its use.	5. Partiality towards the Truth: that is, if science is a form of worship a scientist has to concern himself as much with the consequences of his discoveries as with their production; worship is a moral act and its consequences must be morally good; to do any less is to make a scientist into a immoral agent.

6. Absence of bias-the validity of scientific statement depends only on the operations by which evidence for it was obtained, and not upon the person who makes it.	6. Presence of subjectivity; the direction of science is shaped by subjective criteria; the validity of a scientific statement depends on both on the operation by which evidence for it was obtained and on the intent and the world-view of the person who obtained it; the acknowledgement of subjective choices in the emphasis and direction of science forces the scientist to appreciate his limitations.
7. Suspension of judgement-scientific statements are made only on the basis of conclusive evidence.	7. Exercise of judgement- scientific statements are always made in the face of inconclusive evidence; to be a scientist is to make expert, as well as moral judgement, on the face of inconclusive evidence; by the time conclusive evidence has been gathered it may be too late to do anything about the destructive consequences of one's activities.
8. Reductionism- the dominant way of achieving scientific progress.	8. Synthesis-the dominant way of achieving scientific progress; including the synthesis of science and values.

9. Fragemntation – science is too complex an activity and therefore has to be divided into disciplines, sub-discipliens and sub-subdisciplines.	9. Holistic- science is too complex in activity to be divorced and isolated into smaller and smaller segment; it is a multidisciplinary, interdisciplinary and holistic enterprise.
10. Universalism-although science is universal, its primary fruits are for those who can afford to pay, hence secrecy is justified.	10. Universalism- the fruits of science are for the whole of humanity and knowledge and wisdom cannot be bartered or sold; secrecy is immoral.
11. Individualism-which ensures that the scientist keeps his distance from social, political and ideological concerns.	11. Community orientation; the pursuit of science is a social obligation (*fard kifaya*); both the scientist and the community have rights and obligations on each other which ensure interdependence of both.
12. Neutrality-science is neutral, it is neither good not bad.	12. Value orientation-science, like all human activity is value laden; it can be good or evil, “blameworthy” or “praiseworthy.” Science of germ warfare is not neutral, it is Evil.

13. Group loyalty- production of new kn owledge by research is the most important of all activites and is to be supported as such.	13. Loyalty to God and His Creations- the production of new knowledge is way of understanding the "signs" of God and should lead to improving the lot of His creation- man, wildlife and environment. IT is God Who has provided legitimacy for this endeavour and therefore it must be supported as a general activity and not as an elitist enterprise.
14. Absolute freedom- all restraint or control of scientific investigation is to be resisted.	14. Management of Science; science is an invaluable resource and cannot be allowed to be wasted and go towards an evil direction; it must be carefully managed and planned for and it should be subjected to ethical and moral constraints.
15. Ends justify the means- because scientific investigation are inherently virtuous and important for the well-being of mankind , any and all mean-including the use of live animal, human beings and foetuses-are justified in the quest for knowledge.	15. Ends do not justify the means- there is no distinction between the ends and means of science, both must be *halal* (permitted), that is within the boundaries of ethics and morality.

became the cornerstone for the development of western science. *The* major difference is in the belief system: while Muslim scientists believed in revelation and regarded reason as one instrument for moving close to God, western scientist believes in rationality and dismisses all other forms of knowing as nonsense.

Western science is a product of this belief. In the Islamic perspective, science is one tool for the realisation of religious goals; in the western purview science itself is a universal religion. Thus David Landes in his classic book *The Unbound Prometheus m*akes the point explicit:

> This world, which has never before been ready to accept universally *any* of the universal faiths offered for its salvation, is apparently prepared to embrace the religion of science and technology without reservation.[29]

When science passed from Islam to Western Europe in the middle ages, the Christian ethos and the Protestant ethics, with its concern for industrial and mercantile enterprises, its military rivalries and expansive tendencies, was able to subtly transform science. The rather pathetic, arid sometimes violent, conflict that ensued between "science" and "religion" led to the old authorities- largely the dominant irrationality of an institutionalised church-being challenged and ultimately replaced by a cynical view of authority in all its form. The traditional**,** cyclic view of life was replaced by a linear sense of time and a belief in progress. And in the advance towards ever greater achievements it became axiomatic that Man could and would win an Empire over Nature, as Francis Bacon graphically expressed. Science now became a quest for domination; search for new social institution and new meanings and for more aesthetic and orderly structures of cognition. In its early days it was

the later aspect of science which predominated. In the sixteenth and seventeenth century Europe, the scientist was claiming the right to search for another truth and adopt another mode of contemplation and self–realisation. But that was left-over romanticism from the classical period; by the end of the nineteenth century science had developed a formidable organisational base and the romantic goals had given way for more pragmatic objectives of domination and control. Western science had now become an ideology.

The idea of domination has a distinguished lineage in Western civilization, and its deepest roots are to be found in the dominant religious tradition of that civilization.[30] Only in the modern period, however, was this idea transformed into a socially significant ideology, that is, a conscious principle of legitimacy for a particular phase of Western civilization: capitalism. Science became an ideology when its method became an exclusive way' of knowing reality, the only valid entry into the entire realm of objective understanding and when it assumed the character of instrumental rationality with an exclusive focus on the rationality of means, that is techniques for attaining a given objective in the most 'efficient' manner. It thus, in, a multitude of conceptual forms promoted and represented the interest of a part of society, a particular class, as the interest of the whole society.

The ideology of instrumental rationality treats its object of study (both human and non-human) as mere stuff that can be exploited, manipulated, dissected and generally abused in the pursuit of scientific progress. Thus in the attitudes of such champions of western science as Descartes and Boyle that animals are automata are the origins of the revolting experiments that take place in modern laboratories.

Once again, the legitimacy for such dehumanising actions of modern science are derived from Christian theology where, in medieval times, the idea of beast-machine was well established. It was simply carried over into western philosophy of science because, in ontological terms, the relation between spirit and nature in the dominant Judaeo--Christian theology is analogous to the Cartesian conception of the relation between ego cognito and the realm of matter.

The inherent logic of instrumental rationality has reduced western science into a problem solving enterprise. It is an endless process of solving problems, of freezing or 'fixing' a subject for study and of placing it at a 'distance' to evaluate. In its more extreme form, for example in biological reductionism, it has become what Fromm calls necrophilia, the passion to kill so as to freeze and love. Munawar Ahmad, Anees summarises the inherent destructive logic of reductionism with these words:

> Reductionism, by virtue of its technique and approach, invariably loads to the disappearance of certain attributes peculiar to a given form of life. As a corollary of this, the inter-relationship established through a value structure may crumble. This is precisely what seems to be happening with modern science. Its alleged objectivity and neutrality spring from its adherence to the dictates of reductionism wherein it creates an illusion that at micro level the observations are the same as that at the macro level. It 'is at this critical point that the organismic holistic attributes are sacrificed at the altar of "objectivity." The net products of reductionism are, therefore, a methodological illusion that blurs the social significance of human science and technology, and a "picture" of life without attributes of life is developed.
>
> The havocs caused by the pursuit of reductionist science in the recent past are only beginning to make their impact on our lives. For example, for the first time in history, we are losing controls on human reproduction.

> Birth control has become a misnomer for genetic engineering has reached a stage where life at its molecular level can be tempered with. Motherhood has now become a saleable commodity for we can buy eggs or even rent a uterus. In its euphoria for "perfection" of techniques or celebration for the recombinant DNA technology, reductionists have utterly neglected the social upheavals that will *certainly* be triggered by such "hot" pursuits of mindless scientific activity.

Is there an end to reductionism? And is there an alternative to reductionism? The argument that reductionism should be allowed to take its logical course is now dangerously untenable. Moreover, the stand that reductionism is by itself a good thing because the pursuit of knowledge can only bear beneficial fruits for mankind is naive-there is no indigenous self correcting methodology in reductionism that will stop it from the path of oblivion.[31]

The logic of reductionism reduces objectivity to objectification. Behaviourists like J.B. Watson and B.F. Skinner have only taken to its logical conclusion this process of objectification. How far they derive their legitimacy from the promise of scientific control over human fate is obvious from the fact that behaviourism remains the official ideology of both western modernism and Soviet Marxism.

The objectification of a phenomena yields mythical illusion of progress. This illusion has been used to justify blatant injustice and authoritarianism: western science, as it is widely believed, is not an *ally against* authoritarianism; on the contrary, it has an in-built tendency to be an *ally* of authoritarianism. It is in science that justification of oppression and domination 'is sought, The excesses of Western civilization, colonialisation and racism, class hatred and sex-ism, and a host of social problems that have been generated -by western society, are now attributed, by the magical processes

of objectification, in the fixed interactability of humanity's biological nature. Inequalities of wealth and power, violence and aggression, competetiveness and xenophobia, it is claimed, far from being socially and politically determined, are being reduced to being merely the inevitable products of the human genome and the process of biological evolution.[32] It is noteworthy how authoritarian ideologues of the new Right, from Reagonite militarists to Thatcherite monetarists to the fascists of France, Britain and Israel, have seized upon and reiterated scientific ideologies which emphasise the fixity and "naturalness" of human nature: works of such sociobiologists and proponents of I.Q. theory as Robert Ardrey, Desmond Morris, Edward Wilson, Richard Dawkins, Hans Eysench and Arthur Jensen.

These are not accidental developments: they are a logical outcome of the nature and style of western science. Most scientists, particularly in the Muslim world, have a textbook, fairy-tale image of how science works. Most textbooks which have a chapter on Scientific method have various ideas about what this includes, but all of them are equally dogmatic about the three or four points they mention: observation, hypothesis, experimentation, conclusion and the like. This story book image is taken further by presenting a linear model of "autonomous science" (Figure 3). At best the textbook version falsifies science: in real science one works to propagate a particular hypothesis and does not start with it; observations are often selective; experiments are carried out to support conclusions; it is often considered highly praiseworthy to be unwilling to change one's opinion in the light of latest evidence; lack of humility is highly valued; often the application of results have already been worked

out; bias is freely acknowledged; and there is a great deal of emphasis on the importance of intuitive judgement.

Therefore, research activity does not always produce results leading to the True and the Good. Of course, we know that there are at least other factors that play a part in the process of scientific research: curiosity and social need. Sometimes a perceived social need stimulates research which produces results which satisfy the need. The process may throw up new problems which excite curiosity and the process repeats itself (Figure 4). It is to the credit of some social critics of science who argue that both motivations are necessary for a healthy growth of science: pure curiosity leads to "ivory tower" science with only haphazard application to social needs; and excessive concentration on application leads to the trivialization of research.

Figure 3

Figure 4

To this largely dominant, but somewhat simplistic picture of how western science works, Marxist philosophers of science, most notably].D. Bernal, have added the elements that most distort the picture. First of all scientific curiosity can be clocked by "dogma and superstition." Up to the end of nineteenth century, this dogma and Superstition was generated by the institutionalised Church; today it is produced by secular institutions and the various ideologies of domination. More simply, applications of science can be clocked or distorted by commercial greed. Or science can be distorted by applications which are deformed and evil: the worst being war. War science now employs over half the crops of scientists worldwide: all the major powers of the world today spend disproportionately large percentage of their natural resources on military science. Hence, the new enriched picture of how science works in reality (Figure 5).

Figure 5

But this is as far as Marxist analysis of science takes us. Being a progeny of the Judeo-Christian heritage, Marxism's faith in science as the ultimate value and the arch force for Goodness and Truth is unshakable. Hence the role of "scientific" revolutions and "scientific" socialism in Marxists theory. Marx, as opposed to many latter clay Marxists and the champions of the New Left, was a complete prisoner of nineteenth century scientism and instrumental rationality. As Ashis Nandi has put it, "in spite of his seminal contribution to the demystification of the industrial society, he did not have a clue to the role modern science had played in the legitimation of such a society. The product of a more optimistic age, he faithfully put science outside history. That is why Stalin is not an accidental entry in the history of Marxism. He remains the brain-child of Marx, even if, when considered in the context of Marx's total vision, an illegitimate one.[33]

Recent critics of western science including J.R. Ravetz, Theodore, Roszak and Ian Mitroff have added four more factors to the picture of how western science operates in the real world. First, is the factor of unfulfilled promises; that is, no matter how much research is done to find a solution for a pressing social needs, the research remains ineffective. No matter what quantity of financial resources are poured into research, the Promethean promise remains unfulfilled. Perhaps the most obvious example here is the ever increasing, indeed maddening pursuit to conquer cancer.

Unfulfilled promises and misplaced optimisms only lead to disappointments. But now we must face an even more serious outcome of the contemporary practice of western science: they ever present shadow of ecological catastrophe.We have learnt recently that science not only has intended

outcome, it can also have many unintended, unplanned, side-effects too. Indeed , beyond the first order effect of science lies a whole minefield of second and third order consequences which a scientist never imagines. As Ravetz points out, most well meaning scientists have been

> ... victims of what we can now see as an illusion, from which we only now are recovering; that is, that the conscious benevolent applications of science cannot do harm. This assumption, or rather faith, has a long history, back indeed to the seventeenth century we can see it in Francis Bacon, who really believed that magic and the idea of "powers too great to be revealed" were not merely sinful, because you were getting something for nothing, but also implausible, because things do not ***really*** happen like that. As the vision of the world (for European peoples) lost its quality of enchantment, it became commonsense that science was really safe-effects could only be proportionate to their (material) causes. The idea of a trigger reaction, of a non-linear, synergistic reaction, of an ecological system, was effectively absent from mainline scientific thinking ... until well into the postwar period. In the absence of such ideas, one cannot imagine blunders, and cannot imagine somethings with which we are now confronted as urgent problems of survival. [34]

One can plead innocence for unforeseen outcome of one's research, however serious they may be. But one can also *consciously* conduct research, into unethical areas and inhuman domains all in the name of curiosity. The lack of ethical control is a major factor in the destructive nature of western science. If one considers science to be a "pure," virtuous activity, it is only a short step to the illusion that scientists themselves are somehow purified by the activity of research. Western science refuses to treat the scientist as a human being with weaknesses and imperfections. Rather, it claims a special status for scientists as far as the

goals of science are concerned. Yet, it refuses to acknowledge that the scientist may have a vested interest in science. When one considers that science refuses to allow criticism from the outside or admit ethical constraints, one can truly appreciate how the domineering present of science in our society has made the entire society the prisoners of a small group of professionals who, unlike the political elite in their position, are relatively exempt from criticism, checks and values of society.

It is, however, always possible for an individual scientist to work according to his own conscience. However, much of western science is "big science" requiring organisations which are also large scale as well as complex and possessing a tendency to take on a life of their own. There is not much scope here for an individual scientist to preserve his individuality. "Big science" consists of hierarchically organised laboratories in which individual scientist seeks solutions to minute segments of problems often unaware of connection between the overall jigsaw and the puzzle they are solving. Institutionalised science has now managed to do the impossible: it has become simultaneously a market place and vested interest. It has an organisational logic of its own independent of the creativity of the individual scientist but dependent on-and observing his material interest. It is this hierarchical organisation of science, with its priests and clergy, which has pre-empted basic internal criticism in science. No scientist can now say anything about science policy and scientific choices which is not uncoloured by organisational interests of science or can be taken on its face value.

When we incorporate such factors as unrealism, the possibility of ecological blunders, the acute questions of

ethics and the organisational structure of science into our picture of western science, an altogether new beast makes an appearance (Figure 6).[35] This *system* of science has its own internal dynamic which transforms every society it touches: indeed, the "society" of "science" cannot survive as an uncontaminated heaven of non-material values. If it continues on its present journey, its relentless logic will inevitably lead to the total destruction of man's terrestrial abode-the Promethean fire, stolen from Heaven by Man's quest of knowledge and Power, burns just as fiercely as any.

Figure 6

Argument Four:

Western science cannot meet the physical, cultural and spiritual needs and requirements of Muslim societies.

It is easy for us to overlook the inherent destructive nature of western science for one very strong reason: it works. The glittering successes of western science are many and diverse: it has enabled western civilization to amass unimagined power and wealth; it has even relieved ordinary people of discomfort, pain, deprivation and squalor to a degree; it has made it easier for us to travel, communicate and manipulate information. These are by no means small achievements.

But the point is not that western science works. The point is that it works in a particular way that is designed to fulfil the needs and requirements of a society and culture with a specific world-view. It is designed to fashion the image of the western civilization wherever it operates. That's why, wherever and whenever its problem-solving techniques or its products are applied the end result is an inferior reproduction of some segment of western society. Thus promoting the myth that both western science and western civilization- implicitly implying that their values and culture-are universal.

The prime concern of the system of western science is its own survival and extension. To do that it must give absolute priority to itself, its own societal and civilizational roots. This it does in some straight forward mechanical way. The process, in fact, is very subtle. Glyn Ford describes the main mechanics of the process:

> Science and technology depend heavily upon state finance and there is always more waiting to be done than resources available. That which is undertaken

> is done at the expense of alternative choices. Those who arbitrate between options do so on the basis of their own ideological presuppositions. To expect otherwise is naive. Thus the choice of the trajectory of science and technology is partisan. Although this is not lo suggest that the work of contemporary scientists and technologists always neatly meshes with the requirements of contemporary western society. Developments within science and technology emerge from an adversary process in which hypotheses compete for intellectual dominance. But the judging is rigged.

New scientific laws, for example, are not brought to society like the tablets from the mountain. They emerge from a field of competing alternatives, all of which reflect, to a greater or lesser extent, aspects of the multidimensional world of nature. The determination of which is to be the victor is not a simple one. It is not determined purely on grounds of truth content or to suit the implicit wishes of those in positions to authority. Rather it comes from a continuous and multiple series of interactions between science, scientists and society. Nevertheless, the choices that can be made are extremely limited. For mental slavery is as coercive as its physical counterpart.

> The ***values*** science and technology must always reflect are those material values of acquisition, unchecked and uncontrolled growth and Darwinian competition. Spirit and compassion become marginal at best and ornamental at worst. There is an inevitability about the creation of technologies that are intensive, large-scale and highly centralised; in a word 'inhuman.[36]

As the style and packaging of western science reflects the needs and priorities of an alien system it can never meet the requirements of Muslim culture and society. This is largely why western science has not taken social root in Muslim countries. And this is why, in the Muslim world today;

science is sporadic, isolated, largely unconnected with local needs and interest and quite incapable of self -sustenance. Most proponents of science decry the poor spending on science in the Muslim countries: but that is only an external symptom of a very deep malaise. And that malaise lies not just with Muslim societies but also with the nature and style of science that is backed and promoted.

One of the most common example of the wide gulf between what is needed in Muslim societies and what science offers relates to capital and labour: much of western science is geared to producing labour-saving, capital intensive final products; yet, in the majority of the Muslim world there is excess of labour and shortage of capital, what the vast majority of Muslim people need are simple solutions to their basic problems of every day living; what western sciences is geared to is producing sophisticated solutions requiring massive inputs of energy. The most common killers in the Muslim world are diarrhoea and schistosomiasis; much of science-based modern medicine is looking for cures to lung cancer, heart disease and concentrating on transplanting various bits of anatomy from one individual to another. Health problems in Muslim societies cannot be more basic: overcrowded and insanitary city life kills a high number of children and nurtures diseases such as cholera and malaria, Yet western medicine is too preoccupied with herpes and AID, test tube conception and cryogenic freezing. In most Muslim countries obtaining energy to cook could be a major problem for a family; while western science concerns itself with fast breeder reactors and development of nuclear missiles.

But it is not just a question of wrong priorities and emphasis, Muslim societies also have spiritual, cultural and environmental

needs that western science can never fulfill. Indeed, it can only aggravate such needs. The most blatant example of this is the imposition of solutions derived from western science and technology on the hajj environment. On the face of it the problem of the hajj environment is simple: meeting the accommodation, transport and material needs of pilgrims visiting Mecca and Medina every years, while preserving the ecological and spiritual character of the holy areas. Since the early seventies, almost every solution that modern science and technology can produce has been tried. The problems have not only become worse but the very environment for which these solutions were sought has been destroyed. The entire environment has been turned into an extension of western society.

The methodology of reduction cannot take into consideration cultural and spiritual needs. Neither can it grapple with social complexities. Schistosomiasis has been isolated from society and has been studied in Egypt and Sudan for over 50 years; yet a solution to this problem is no where in sight because its connection with irrigation, education, the play needs of children, rural development *et cetera* have not been taken into account. Reductive science approaches agriculture as though it was a problem and riot a way of life: that is why agricultural research in Muslim countries has not borne much fruit; it has concentrated on crop yields, developing new strains of seeds, and the use of pesticide and high yield fertiliser. The social aspects of agriculture are beyond its scope.

One can go on listing the dichotomy between the physical, social, cultural and spiritual needs of Muslim societies and what modern science has and can deliver. But the record of western science in Third World countries-

including those which have developed a sophisticated infrastructure such as India and Brazil and those which have tried to buy western science and technology such as Saudi Arabia, Libya and pre-Revolutionary Iran -speaks for itself. 1 have documented and analysed it in considerably detail elsewhere. [37]

Islamic Science: The Way Ahead

The only true way of meeting the multidimensional needs of Muslim societies is to develop a science which draws its inspiration from the cultural and spiritual ethos of the worldview of Islam and is specially geared to meeting these needs. I have argued in this essay that different civilization had different sciences reflecting their particular worldview. I have also tried to show that Islamic science in history had a unique nature and style and that western science today also embodies within itself the Judeo-Christian intellectual heritage. Furthermore, 1 have argued that western science is intrinsically destructive: the application of western science and technology in Muslim societies is playing havoc with our values and culture and is not meeting our needs and requirements. Given this backdrop, the need for a contemporary Islamic science becomes imperative.

1 have argued that the world-view of Islam maintains a unified structure through a matrix of eternal values and concepts which have to be lived and realised and which give the civilization and world-view of Islam its unique character. Because Islam is a total system, these values and concepts permeate every aspect of human life and endeavour. Nothing is left untouched: whether political structures or social organisations, economic concerns or educational curricula,

environmental outlook or framework for scientific enquiry and technological pursuits. These values shape the parameters of Muslim society and guide the civilization of Islam towards its manifest destiny.

Within the cordon of such values and concepts as *tawheed* (unity of God), *khilafah* (man's trusteeship of God's creation), *akharah* (man's accountability in the Hereafter), *ibadah* (worship of one God), **ilm (the pursuit of knowledge),** *adl* (social justice) and *istislah* (public interest). Muslim individuals and societies are free to express their individuality and meet their needs according to their wishes and resources. And, indeed, throughout the history of Islam, different Muslim societies have lived and realised these values and concerns in different ways according to their time and place. It is by this mechanism that the Islamic civilization adjusts to change yet retains its unique and eternal characteristics.

Contemporary Muslim societies have particular needs and requirements which have to be met within the purview of the world-view of Islam. Some of these needs, like food and shelter, are common to all men. Others, such as the need to overcome dependency and technological exploitation, are a product of the particular historic situation of the Muslim societies. Still others are an outcome of Muslim culture: the type of dwellings that are most suited for an Islamic way of life, cities that express the cultural and aesthetic concerns of Islam, and a natural environment that exhibits the Islamic relationship between man and nature. All these needs have to be fulfilled within the value structure of Islam. They have to be fulfilled with the full realisation that Islam is a total system in which everything is interlinked. Nothing compartmentalised or treated as an

"isolated" problem or need. As such methods, processes and tools for meeting these needs and solving the problems of contemporary Muslim societies must be an embodiment of culture and values of Islam. It also means that;science, one) of the most powerful tools for solving man's problems and meeting his needs, has to operate within the circumference of the eternal values and concepts of Islam.

As the history of Islamic science teaches us, a science that operates within an Islamic value structure has a unique nature and style. It is essentially a *subjectively objective* enterprise: objective solutions to normative goals and problems are sought within an area mapped out by the eternal values and concepts of Islam. In Islamic science, both the ends and means of science are dictated by the ethical system of Islam: thus, both the objectives of science as well as its tools, processes and methods have to conform to Islamic dictates. These dictates have nothing to do with dogma; but everything to do with ethics. Islamic science is beyond dogma and does not degenerate to the level of naive inquiry, it is a systematic, rigorous pursuit of truth**,** **a** rational and objective problem solving enterprise that seeks to understand the whole of Reality. It is Wholistic and is founded on synthesis. It seeks to understand and preserve the object of its study. It treats scientists as human beings who have weaknesses and who are part of the community and not outside it. It seeks to fulfill the needs of the vast majority and not a select few. It reflects the hopes and aspirations of the entire Muslim ***ummah.*** We need Islamic science because Muslims are a community of people who "do good and forbid the evil" and to show that science can be a positive force in society. We need Islamic science because the needs, the priorities and emphasis of Muslim

societies are different from those that science has incorporated in the western civilisation. And, finally, we need Islamic science because a civilisation is not complete without an objective problem solving system that operates within its own paradigms. Without Islamic science, Muslim societies will only be an appendage to western culture and civilisation. In short, we have no viable future without Islamic science.

Notes

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